

BENEFITS OF LIVE MICROORGANISMS IN ORAL HEALTH - A REVIEW



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INTRODUCTION

The human gut contains 10 times more bacteria than cells elsewhere. The enormous biomass consists of over 400 known bacterial species that generate intense metabolic activity and are of key importance for human health. This eco-system gets disrupted when exposed to toxins in the form of polluted water and food as well as injudicious use of antibiotics.^{1,2,3} This causes destruction of beneficial bacteria leaving the resistant ones, pathogenic. Of late it has been realized by health care professionals and prompted them to seek alternative therapeutic options. One such alternative is the use of beneficial bacteria, the probiotics, which stimulate health-promoting indigenous flora and reverting back the change.^{1,2,4} The concept of oral foci of infection, affecting the systemic health has been extensively researched.^{3,4} Removal of these oral foci using probiotics in the oral cavity has tremendous improvement in general health of the individual. This proposed concept is reinforced by recent evidences that probiotics may play a vital role in oral ecology.⁴ The aim of this review was to present a general background on probiotic administration and its health effects in children and young adults.

DEFINITION

Probiotics are bacterial cultures or living microorganisms upon ingestion in certain quantity promote and enhance health benefits.^{3,4} An International Life Science Institute Europe proposed a definition of probiotics as 'Viable microbial food supplements which beneficially influence the health of human. These bacteria should belong to the natural flora in order to resist gastric secretion and survive during intestinal transit. They should also adhere to the intestinal mucosa and finally should have the ability to inhibit gut pathogens.'^{2,3,4}

Prebiotics are non digestible food ingredients such as fructo-oligosaccharides (FOS), lactulose and inulin that beneficially affect the host by selectively stimulating growth and/or increase activity of a limited number of probiotic like bacteria in a colon¹.

HISTORY:

The dietary use of living microorganisms has a long history. Mention of cultured dairy products is found in the bible and the sacred books of Hinduism. In 1907, Elie Metchnikoff postulated that consumption of Bulgarian yoghurt promotes good health. In 1950, a probiotics product was used as a drug for the treatment of scour among pigs. Lilley and Stillwell (1965) introduced the term probiotics. Mann and Spoering in 1974 discovered that the fermented yogurt reduced blood serum cholesterol. In 1984 Hull identified the first probiotic species, the *Lactobacillus acidophilus*. Later in 1991, Holcomb identified *Bifidobacterium bifidum*. WHO in 1994 described the probiotics as next most important in immune defense system following antibiotic resistance. These incidences paved way for a new concept of probiotics in medicine and dentistry^{4,5,6}. Recently there are reports of usage of lactic acid bacteria in microbial infections and cancer due to their immunostimulatory properties^{6,7}.

These microorganisms can inhabit the bio-film and actually protect oral tissue from disease. They also have cariostatic activity; help in preventing candidal colonization and act as antioxidants⁴.

CHARACTERISTICS OF BACTERIA:

Belong to the natural flora :

1. Be able to resist acid and bile.
2. Survive during intestinal transit.
3. Adhere to the intestinal mucosa, and produce antimicrobial substances in order retain the characteristics that contribute to their beneficial health effects.
4. Have the ability to inhibit gut pathogens.

Have to preserve their stability during manufacture and storage which can influence both viability and functional properties.

Table 2. Probiotic bacteria and their effects

Strain	Beneficial effect
<i>Lactobacillus acidophilus</i> LA1	Adherence to human intestinal cells Balances intestinal microflora Immune enhancement
<i>Lactobacillus</i> GG	Prevention of antibiotic-associated diarrhea Treatment of rotavirus diarrhea Treatment of diarrhea caused by <i>Clostridium difficile</i> Stabilisation of Crohn's disease
<i>Lactobacillus casei</i> Shirota	Prevention of intestinal microbiota disturbance Positive effects on bladder cancer
<i>Lactobacillus gasseri</i>	Carcinogenic-associated enzyme reduction
<i>Bacillus subtilis</i>	Use for oral bacteriotherapy Restoration of normal microbial flora Immunostimulatory agent
<i>Bifidobacterium bifidum</i>	Prevention of viral diarrhoea
<i>Propionibacterium freudenreichii</i>	Growth stimulation of other 'friendly' bacteria

MECHANISM OF PROBIOTIC ACTION ON ORAL HEALTH:

Nevertheless, since the mouth represents the first part of the gastrointestinal tract, there is every reason to believe that at least some probiotic mechanisms may also play a role in that part of the system.⁵ It may also be anticipated that resident probiotics could exist in the oral microflora, and that they may function in the complex ecosystem of dental plaque and in the formation and development of oral biofilms in general. Hypothetical mechanisms of probiotic action in the oral cavity (oral biofilms and microflora) suggested in Table 1..^{7,8}

Table 1 - Suggested mechanisms of probiotic in the oral cavity⁸

Direct interactions in dental plaque

- Involvement in binding of oral micro-organisms to proteins(biofilm formation).
- Action on plaque formation and on its complex ecosystem by competing and intervening with bacteria-to-bacteria attachments.
- Involvement in metabolism of substrates (competing with oral micro-organisms of substrates available).
- Production of chemicals that inhibit oral bacteria (antimicrobial substances).

INDIRECT PROBIOTIC ACTIONS IN THE ORAL CAVITY

- Modulating systemic immune function.
- Effect on local immunity.
- Effect on non-immunologic defense mechanisms.
- Regulation of mucosal permeability.

CONCLUSION

Probiotics are emerging as a fascinating field in oral medicine.⁸ This concept prompts a new horizon on the relationship between diet and oral health. Clinical trails should be directed to assess the method of probiotic administration in oral cavity and dosages -

for different therapeutic uses. Research should be directed towards the action of probiotics on oral cavity and also on its pathological conditions.⁹

FUTURE TRENDS

Probiotics can be used as passive local immunization against dental caries. High titers of antibodies can also be directed against human cariogenic bacteria produced in bovine colostrum over the vehicle of fermented milk.¹⁰ Early mucosal colonization with *E.coli* bacteria in newborn stimulates mucosal immune system to produce specific antibodies as well nonspecific secretory immunoglobulins. Research is directed at the reduction of severity and occurrence of mucosal lesions, specifically aphthous ulcers.^{7,8}

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